Development and Initial Evaluation of a Reconstituted Water Formulation That Better Represents Natural Waters

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The use of reconstituted waters is deeply entrenched in many standardized aquatic toxicity testing protocols The primary appeal of reconstituted waters is inter-laboratory comparability, such that experiments performed in different laboratories can be conducted in (nominally) identical waters While several formulations of reconstituted waters have been developed over the years, many aquatic toxicity test protocols from the US EPA and ASTM use a formulation that has its roots in a publication by Marking and Dawson (1973) While widely used, the ionic composition of these waters is not typical of North American surface waters; for example, the molar Ca:Mg ratio in EPA/ASTM water is 070, but is averages about 22 in US waters More dramatic are the differences in molar Cl:SO_4 ratio, which is 00632 in EPA/ASTM water, but is more typically in the range of 1 to 2 in US waters We have developed a new reconstituted water formulation based on an analysis of natural waters from across the US Hardness was chosen as the master variable from which the remaining composition is calculated The subsequent relationships that define the water composition are alkalinity v hardness, Ca:Mg ratio, Cl:SO_4 ratio v hardness, and K as a proportion of Na + K Exactly mimicking natural waters is tedious in the laboratory, because natural waters gain alkalinity from calcium and magnesium carbonates, salts which are difficult to dissolve; this formulation uses only readily soluble salts, though this logistical convenience sacrifices some fidelity to the central tendency of natural waters Recipes for water of any hardness (recommended bounds of 10 to 400 mg/L as calcium carbonate) can be calculated in a simple spreadsheet Initial evaluation of these waters in chronic tests with *Ceriodaphnia dubia* and *Daphnia magna*, and short-term chronic tests with fathead minnows (*Pimephales promelas*), have shown performance in our proposed reconstituted water to compare favorably with Marking and Dawson-based waters or natural Lake Superior water Additional testing with *Chironomus dilutus* and *Hyalella azteca* is planned Using reconstituted waters that are more representative of natural waters should improve assessment of chemicals whose toxicity is influenced by the ionic composition of the water (eg, many cationic metals), and may also improve performance of some organisms found to be sensitive to the ionic composition of water (eg, *Hyalella*) *This abstract does not necessarily reflect USEPA policy*

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